

Section I. Amendments of the Specification

1. Please replace the paragraph on page 10, lines 16-21 through page 11, lines 1-2 with the following new paragraph:

Still another aspect of the present invention relates to a filter assembly, which comprises:

- (a) a first manifold end plate;
- (b) a second manifold end plate;
- (c) one or more integral filtration cassette structures as of claim 1 secured between the first and the second manifold end plates, wherein the thin gasket layers of said integral filtration cassette structures form fluid-tight sealing surfaces between said filtration cassettes and said first and second manifold end plates as well as between adjacent filtration cassette structures.

2. Please replace the paragraph on page 12, lines 4-5 with the following new paragraph:

Figure 4 is an exploded view of a filter assembly comprising an integral filtration cassette structure according to one embodiment of the present invention between two manifold end plates.

3. Please replace the paragraph on page 12, lines 13-14 with the following new paragraph:

Figure 9 is a top plan view of a ~~retentive~~ retentate sheet of a type which may be usefully employed in the cassette of Figure 2.

4. Please insert the following paragraphs on page 13, immediately following line 11:

Figure 13 is a cross-sectional view of an embodiment of a gasketed filtration cassette structure of the present invention comprising the filtration cassette of Figure 2 and terminal end plates fully encapsulated by a gasket layer.

Figure 13A is a cross-sectional view of an embodiment of a gasketed filtration cassette structure of the present invention comprising the filtration cassette of Figure 2 and terminal end plates partially covered by two gasket layers on its top and bottom surfaces.

Figure 14 is an exploded elevation view of a filter assembly comprising a filtration cassette according to an embodiment of the present invention with a gasket fully encapsulating a filtration cassette comprising terminal end plates.

5. Please replace the paragraph on page 14, lines 1-4 with the following new paragraph:

The integral filtration cassette structure of the present invention is adapted to be used in combination with filtration cassette holder comprising at least two manifold end plates for holding said filtration cassette structure, with the improvement of having an integral filtration cassette/gasket structure substantially invulnerable to misalignment or leakage caused thereby.

6. Please replace the paragraph on page 14, lines 13-20 through page 15, lines 1-2 with the following new paragraph:

The filter cassette of the present invention comprises a base sequence of retentate sheet (R), filter sheet (F), permeate sheet (P), filter sheet (F), and retentate sheet (R), which may be repeated in the sequence of sheets in the filter cassette as desired, e.g., in a repetitive sequence of retentate sheet (R), filter sheet (F), permeate sheet (P), filter sheet (F), retentate sheet (R), filter sheet (F), permeate sheet (P), filter sheet (F), retentate sheet (R), filter sheet (F), retentate sheet (R). Thus, the filter cassette of a desired total mass transfer area is readily formed from a stack of the repetitive sequences. In all repetitive sequences, except for a single unit sequence, the following relationship is observed: where X is the number of filter sheets, $0.5X-1$ is the number of interior retentate sheets, and $0.5X$ is the number of permeate sheets, with two outer retentate sheets being provided at the outer extremities of the stacked sheet array. The filter cassette may further comprise two terminal end plates positioned on either end of the sequence of sheets.

7. Please replace the paragraph on page 21, lines 6-18 with the following new paragraph:

Figure 4 is an exploded view of a cross-flow filter assembly 200 comprising the integral gasket filtration cassette structure 12 as in Figure 3 being placed between a first manifold end plate 30 and a second manifold end plate 60. The first manifold end plate 30 is generally a mounting plate having vertically upwardly extending rods 34, 36, and 38 at its respective corner portions as shown. The rods 34 and 36 are of the same diameter, wherein the rod 38 is of larger diameter to provide the plate orientation keying structure, which will ensure that the constituent plates of the filter assembly are assembled in the proper orientation, since the corresponding rod mounting openings 18 and 20 in the cassettes, e.g., cassette 12, are of the same diameter, accommodating the smaller diameter rods, while the third rod mounting opening 22 is of larger diameter, to accommodate rod 38. Thus, by providing a rod of larger diameter, and forming the cassettes 12 with correspondingly shaped openings, the proper registration of the cassette openings with the proper rods is assured, resulting in correct orientation of the respective stacked filtration cassettes in the array.

8. Please replace the paragraph on page 21, lines 19-20 with the following new paragraph:

The first manifold end plate 30 optionally has vertically upwardly extending rods 72, 74, 76, and 78 correspond to openings 64, 66, 68, and 70 in the filtration cassette.

9. Please replace the paragraph on page 22, lines 1-9 with the following new paragraph:

It will be appreciated from the foregoing that any other cassette orientation registration device may be employed to ensure [[to]] correct positioning of the filtration cassette on the end manifold plate 30. For example, the cassettes are oriented with their successive notches superposed with respect to one another. Alternatively, the cassette itself may be embossed, etched, or otherwise manufactured with an orientational device, e.g., a raised protrusion in the

shape of an arrow, to indicate the correct orientation of the filtration cassette when stacked on the end manifold plate 30. Although only one filtration cassette is illustratively shown in the Figure 4 embodiment, it will be recognized that one or a plurality of cassettes may be employed to form a filter in accordance with the present invention.

10. Please replace the paragraph on page 22, lines 10-15 with the following new paragraph:

Overlying the cassette 12 in the exploded array of Figure [[1]] 4 is a second manifold end plate 60, which is provided with suitable openings 18, 20, 22, 64, 66, 68, and 70 accommodating the insertion therethrough of the rods 34, 36, 38, 72, 74, 76, and 78. Such second manifold end plate 60 as shown is suitably engaged by mechanical fastener assemblies 85, comprising washer 86 and lock-nut 88, which threadably engages the complementarily threaded upper ends of the respective rods 84A...84K, and 84L.

11. Please replace the paragraph on page 22, lines 16-19 with the following new paragraph:

At the upper left-hand corner portion of the manifold end plate 30 as shown in Figure [[1]] 4, adjacent to rod 36, there is provided a liquid outlet conduit 8 in flow communication with openings 50A and 50B extending through the manifold end plate 30 and communicating with the quadrilateral-shaped collection basins 54A and 54B of the cassette.

12. Please replace the paragraph on page 23, lines 1-6 with the following new paragraph:

The manifold end plate 30 also is provided at its right-hand side margins, at the distal section of the longitudinally extending plate, with permeate collection trough 58 which is in flow communication with permeate outlet conduits 62A and 62B. This is employed for egress of permeate produced in the filtration operation (and issuing from filtrate or permeate opening 26 A,

B, C, D, E in cassette 12) and/or otherwise for accommodating ingress/egress of a selected fluid, such as steam or other sterilant fluid for effecting cleaning and regeneration of the filter.

13. Please replace the paragraph on page 23, lines 7-10 with the following new paragraph:

At the lower right-hand corner portion of the manifold end plate 60 shown in Figure [[1]] 4 there is provided a liquid inlet conduit 44 in flow communication with openings 46A and 46B (not shown) extending through the end plate 60 and communicating with the quadrilateral-shaped collection basins 48A and 48B of the cassette.

14. Please replace the paragraph on page 23, lines 11-16 with the following new paragraph:

The manifold end plate 60 also is provided at its left-hand side margin, at the near-section of the longitudinally extending plate, with permeate collection trough 56 (not shown) in flow communication with permeate outlet conduits 52A and 52B. This conduit is employed for egress of permeate produced in the filtration operation (and issuing from filtrate or permeate opening 24 A, B, C, D, E in cassette 12), and/or otherwise for accommodating ingress/egress of a selected fluid, such as steam or other sterilant fluid for effecting cleaning and regeneration of the filter.

15. Please replace the paragraph on page 24, lines 8-18 with the following new paragraph:

It will be appreciated that the permeate openings 24 A, B, C, D, E and 26 A, B, C, D, E may, as previously described, be coupled to a flow circuit including a second mass transfer medium which is to be passed in mass transfer relationship to the primary feed material stream entering the filter in conduit 44. By such arrangement, mass transfer can be carried out in both directions across the filter sheets in the cassette. Alternatively, the filter may be used as shown, with the openings 24 A, B, C, D, E and 26 A, B, C, D, E being used for discharge of permeate. It will be recognized that instead of two permeate conduits 62A and 62B on the manifold end plate

30, and two permeate conduits 52A and 52B on the manifold end plate 60, both permeate outlet conduits may be provided on the first manifold end plate 30, or on the second manifold end plate 60, or alternatively, both plates may feature any number of permeate discharge conduits secured thereto and in communication with the permeate openings of the cassette(s).

16. Please insert the following paragraphs on page 27, immediately following line 16:

Figure 13 is a cross-sectional view of an embodiment of the filtration cassette of the present invention comprising the filtration cassette of Figure 2 and terminal end plates 101, 111, said filtration cassette being fully encapsulated by a gasket layer 2 on all its sides, and Figure 13A is a cross-sectional view of an embodiment of the filtration cassette of the present invention comprising the filtration cassette of Figure 2 and terminal end plates 101 and 111, said filtration cassette being covered by two gasket layers 2 only on its upper and bottom surfaces.

Figure 14 is an exploded elevation view of a filter assembly FA comprising a filtration cassette FC according to the invention and the respective manifold end plates 30, 60, wherein said filtration cassette utilizes a "hard shell" arrangement comprising terminal endplates 101, 111 and at least one thin gasket layer is bonded to and fully encapsulates all outer surfaces of the filtration cassette.

The filtration cassette FC includes a central permeate sheet 106, to the respective faces of which are bonded the filter sheets 104 and 108. Exterior to the filter sheets in the cassette array are retentate sheets 102 and 110. The retentate sheets 102 and 110 may be of rigid and solid form, and are respectively bonded to the terminal end plates 101, 111 to complete the structure of the filtration cassette. It will be appreciated that the filter assembly FA may comprise a number of sequentially arranged filtration cassettes FC, only one being shown in Figure 14 for ease of simplicity and to facilitate description. In this manner, a "hard shell" cassette is formed.

A gasket layer, which fully encapsulates the filtration cassette and forms an integral structure with such filtration cassette, is provided between the terminal end plates 101, 111 and

the manifold end plates 30, 60 of the filter assembly, such manifold end plates having an outlet O from which the filtered retentate may be discharged from the filter assembly, an inlet I to which the material to be filtered is introduced to the filter assembly, as well as at least one permeate port PT from which the collected permeate is discharged from the filter assembly.

In such filter assembly, the fully encapsulating gasket effects sealing of the hard shell filtration cassette against the manifold end plates of the filter assembly, with each of the sheets 101, 102, 104, 106, 108, 110, and 111 being interbonded to form a unitary cassette article.